IN THE CLAIMS:

Please AMEND claims 27, 41 and 54, as follows. For the Examiner's convenience, all claims currently pending in this application have been reproduced below:

1. (Previously Presented) A projection exposure apparatus, comprising:

a projection optical system for projecting a pattern of a first object onto a second object;

a first illumination system for illuminating the pattern of the first object under a first illumination condition, wherein the pattern of the first object illuminated under the first illumination condition is projected onto the second object through said projection optical system;

a second illumination system for performing illumination under a second illumination condition;

a light intensity detector, wherein an image of the pattern of the first object, as the same is illuminated by said second illumination system and under the second illumination condition, is formed through said projection optical system, and wherein said light intensity detector detects a light intensity distribution of the image; and

an information processing system for measuring a wavefront aberration of said projection optical system on the basis of the detection by said light intensity detector;

wherein the first illumination condition concerns spatially partial coherency or incoherency, and wherein said second illumination condition concerns spatially coherency or approximate coherency.

2. (Previously Presented) An apparatus according to Claim 1, wherein said information processing system is arranged to detect a phase distribution of the image of the pattern on the basis of light intensity distributions defined in relation to that image at different positions along an optical axis direction of said projection optical system, and to measure the wavefront aberration of said projection optical system on the basis of the detected phase distribution.

3. (Original) An apparatus according to Claim 1, wherein the second object is a photosensitive substrate, and wherein said projection optical system is used to project and print the transfer pattern, being illuminated under the first illumination condition, onto an exposure region on the photosensitive substrate.

4. (Previously Presented) An apparatus according to Claim 1, wherein said information processing system is arranged to measure the wavefront aberration of said projection optical system on the basis of light intensity distributions detected with respect to an imaging position of the image of the pattern and at least one defocus position of thereof, or of light intensity distributions with respect to different positions.

5. (Original) An apparatus according to Claim 4, wherein said information processing system measures the wavefront aberration of said projection optical system in accordance with a phase restoration method.

6. (Original) An apparatus according to Claim 4, wherein said first and second illumination systems include a common element.

7. (Cancelled)

8. (Cancelled)

9. (Previously Presented) An apparatus according to Claim 1, wherein, in each of said first and second illumination systems, a ratio of a numerical aperture of said first or second illumination system to a numerical aperture of said projection optical system is σ, and wherein the first illumination condition satisfies a relation $0.2 < \sigma \leq 1.0$ while the second illumination condition satisfies a relation $\sigma \leq 0.2$.

10. (Previously Presented) An apparatus according to Claim 1, wherein said first and second illumination systems include a common element.

11. (Previously Presented) A projection exposure apparatus, comprising:

a projection optical system for projecting a pattern of a first object onto a second object;

a first illumination system for illuminating the pattern of the first object under a first illumination condition, wherein the pattern of the first object illuminated under the first

illumination condition is projected onto the second object through said projection optical system;

a second illumination system for performing illumination under a second illumination condition;

a light intensity detector, wherein an image of the pattern of the first object, as the same is illuminated by said second illumination system and under the second illumination condition, is formed through said projection optical system, and wherein said light intensity detector detects a light intensity distribution of the image; and

an information processing system for measuring a wavefront aberration of said projection optical system on the basis of the detection by said light intensity detector;

wherein said first and second illumination systems include a common component, and wherein the first and second illumination conditions are defined exchangeably by adding a separate component to said common component or by removing said separate component.

12. (Original) An apparatus according to Claim 10, wherein interchanging the first and second illumination conditions with each other is performed by changing a light source to said common element.

13. (Original) An apparatus according to Claim 1, wherein said first and second illumination systems use different optical systems.

14-17. (Cancelled)

18. (Original) An apparatus according to Claim 13, wherein said first and second illumination systems use different light sources.

19. (Original) An apparatus according to Claim 1, wherein said light intensity detector measures a light intensity distribution in accordance with a knife edge method.

20. (Original) An apparatus according to Claim 1, further comprising an enlarging optical system for enlarging a light intensity distribution to be incident on said light intensity detector.

21. (Original) An apparatus according to Claim 1, further comprising an adjusting mechanism for adjusting an aberration of said projection optical system on the basis of wavefront aberration information detected by said information processing system.

22. (Original) An apparatus according to Claim 1, further comprising means for adjusting an aberration of said projection optical system, prior to projection of the transfer pattern onto the second object through said projection optical system, on the basis of wavefront aberration information detected by said information processing system and information related to the transfer pattern.

23. (Original) An apparatus according to Claim 1, wherein said second illumination system is usable for alignment between the first and second objects.

24. (Previously Presented) A device manufacturing method, comprising the steps of:

performing a projection exposure process for exposing a wafer to a pattern of a reticle, by use of a projection exposure apparatus which includes (i) a projection optical system for projecting a pattern of a first object onto a second object, (ii) a first illumination system for illuminating the pattern of the first object under a first illumination condition, wherein the pattern of the first object illuminated under the first illumination condition is projected onto the second object through said projection optical system, (iii) a second illumination system for performing illumination under a second illumination condition, (iv) a light intensity detector, wherein an image of the pattern of the first object, as the same is illuminated by said second illumination system and under the second illumination condition, is formed through said projection optical system, and wherein said light intensity detector detects a light intensity distribution of the image, and (v) an information processing system for measuring a wavefront aberration of said projection optical system on the basis of the detection by said light intensity detector, wherein said first and second illumination systems include a common component, and wherein the first and second illumination conditions are defined exchangeably by adding a separate component to said common component or by removing said separate component; and

developing the exposed wafer.

25. (Original) A method according to Claim 24, further comprising an adjusting step for adjusting an aberration of the projection optical system on the basis of the detected wavefront aberration.

26. (Previously Presented) A device manufacturing method, comprising the steps of:

transferring, by projection exposure, a pattern of a reticle onto a wafer with use of an exposure apparatus according to Claim 1; and

developing the exposed wafer.

27. (Currently Amended) A projection exposure apparatus, comprising:

an illumination optical system for illuminating a first object and being arranged to provide illumination under a first illumination condition and illumination under a second illumination condition, wherein the first illumination condition includes a first spatial coherency and the second illumination condition includes a second spatial coherency being different from the first spatial coherency;

a projection optical system for projecting a transfer pattern, as illuminated under the first illumination condition, onto a second object;

a light intensity detector for detecting a light intensity distribution of an image of a measurement pattern illuminated by said illumination optical system under the second illumination condition, the image being formed through said projection optical system; and

an information processing system operable to measure aberration including spherical aberration and/or astigmatism of said projection optical system on the basis of a result of a detection by said light intensity ~~detector,~~

~~wherein the first and second illumination conditions have different spatial coherencies~~ detector.

28. (Previously Presented) A device manufacturing method, comprising the steps of:

transferring, by projection exposure, a pattern of a reticle onto a wafer with use of a projection exposure apparatus according to Claim 27; and

developing the exposed wafer.

29. (Previously Presented) An apparatus according to Claim 27, wherein the spatial coherency of the second illumination condition is higher than that of the first illumination condition.

30. (Previously Presented) An apparatus according to Claim 27, further comprising a first light source to be used in the first illumination condition and a second light source to be used in the second illumination condition, wherein the first and second light sources differ from each other.

31. (Previously Presented) An apparatus according to Claim 27, wherein said light intensity detector is disposed adjacent an imaging position of the measurement pattern being illuminated under the second illumination condition, wherein said light intensity detector is arranged to detect light intensity distributions at a different positions, being different from each other, and wherein said information processing system is arranged to measure the aberration including spherical aberration and/or astigmatism of said projection optical system on the basis of the light intensity distributions measured at the different positions.

32. (Previously Presented) An apparatus according to Claim 31, wherein one of the different positions substantially corresponds to the imaging position of the measurement pattern.

33. (Previously Presented) An apparatus according to Claim 27, wherein the transfer pattern and the measurement pattern differ from each other.

34. (Previously Presented) An exposure apparatus, comprising:

an illumination optical system for illuminating a first object and being arranged to provide illumination under a first illumination condition and illumination under a second illumination condition, wherein the first illumination condition includes a first spatial coherency and the second illumination condition includes a second spatial coherency being different from the first spatial coherency;

a projection optical system for projecting a transfer pattern, as illuminated under the first illumination condition, onto a second object;

a light intensity detector for detecting light intensity distributions at different detection positions, being different from each other, with respect to an imaging position of a measurement pattern as illuminated under the second illumination condition, the imaging position being defined by said projection optical system; and

an information processing system for measuring wavefront aberration of said projection optical system on the basis of a result of detection of the light intensity distributions at the different detection positions made through said light intensity detector.

35. (Previously Presented) An apparatus according to Claim 34, wherein the second spatial coherency under the second illumination condition is higher than the first spatial coherency under the first illumination condition.

36. (Previously Presented) An apparatus according to Claim 34, further comprising an adjusting unit for adjusting a size of an effective light source of said illumination optical system, as the first and second illumination conditions are to be switched from one to the other.

37. (Previously Presented) An apparatus according to Claim 34, wherein said illumination optical system includes a stop member, and wherein said stop member is adjusted as the first and second illumination conditions are to be switched from one to the other.

38. (Previously Presented) An apparatus according to Claim 37, wherein an aperture defined under the first illumination condition is larger than an aperture defined under the second illumination condition.

39. (Previously Presented) An apparatus according to Claim 34, further comprising a coherency-transforming optical system which is arranged to be inserted into and/or demounted from said illumination optical system as the first and second illumination conditions are to be switched from one to the other.

40. (Previously Presented) An apparatus according to Claim 34, further comprising a first light source to be used in the first illumination condition and a second light source to be used in the second illumination condition, wherein the first and second light sources differ from each other.

41. (Currently Amended) An apparatus according to Claim 34, wherein ~~the transfer pattern and~~ one of the different detection positions substantially corresponds to the imaging position of the measurement pattern ~~differ from each other~~.

42. (Previously Presented) An apparatus according to Claim 34, wherein the transfer pattern and the measurement pattern differ from each other.

43. (Previously Presented) A device manufacturing method, comprising:

a projection exposure step for transferring, by projection exposure, a pattern of a reticle onto a wafer by use of an exposure apparatus as recited in Claim 34; and

a development step for developing the wafer processed by said projection exposure step.

44. (Previously Presented) An exposure apparatus, comprising:

an illumination optical system for illuminating a first object and being arranged to provide illumination under a first illumination condition and illumination under a second illumination condition, wherein the first illumination condition includes a first spatial coherency and the second illumination condition includes a second spatial coherency being different from the first spatial coherency;

a projection optical system for projecting a transfer pattern, as illuminated under the first illumination condition, onto a second object;

a light intensity detector for detecting an intensity distribution of light directed by said projection optical system to said light intensity detector, from a measurement pattern being illuminated under the second illumination condition;

an information processing system for measuring wavefront aberration of said projection optical system on the basis of a result of detection by said light intensity detector; and

an adjusting unit for adjusting a size of an effective light source of said illumination optical system as the first and second illumination conditions are to be switched from one to the other.

45. (Previously Presented) An apparatus according to Claim 44, wherein the second spatial coherency under the second illumination condition is higher than the first spatial coherency under the first illumination condition.

46. (Previously Presented) An apparatus according to Claim 44, wherein said adjusting unit includes a stop member having an aperture, and wherein the aperture of said stop member is adjusted as the first and second illumination conditions are to be switched from one to the other.

47. (Previously Presented) An apparatus according to Claim 46, wherein the aperture defined under the first illumination condition is larger than the aperture defined under the second illumination condition.

48. (Previously Presented) An apparatus according to Claim 44, further comprising a coherency-transforming optical system which is arranged to be inserted into and/or demounted from said illumination optical system as the first and second illumination conditions are to be switched from one to the other.

49. (Previously Presented) An apparatus according to Claim 44, further comprising a first light source to be used in the first illumination condition and a second light source to be used in the second illumination condition, wherein the first and second light sources differs from each other.

50. (Previously Presented) An apparatus according to Claim 44, wherein said light intensity detector is arranged to detect light intensity distributions at different detection positions, being different from each other, with respect to an imaging position of a measurement pattern as illuminated under the second illumination condition, the imaging position being defined by said projection optical system, and wherein said information processing system is arranged to measure the wavefront aberration of said projection optical system on the basis of a result of detection of the light intensity distributions at the different detection positions made through said light intensity detector.

51. (Previously Presented) An apparatus according to Claim 44, wherein one of the different detection positions substantially corresponds to the imaging position of the measurement pattern.

52. (Previously Presented) An apparatus according to Claim 44, wherein the transfer pattern and the measurement pattern differ from each other.

53. (Previously Presented) A device manufacturing method, comprising:

a projection exposure step for transferring, by projection exposure, a pattern of a reticle onto a wafer by use of an exposure apparatus as recited in Claim 44, and

a development step for developing the wafer processed by said projection exposure step.

54. (Currently Amended) An exposure apparatus, comprising:

an illumination optical system for illuminating a first object and being arranged to provide illumination under a first illumination condition and illumination under a second illumination condition, wherein said first illumination condition includes a first spatial coherency and said second illumination condition includes a second spatial coherency being different from the first spatial coherency;

a projection optical system for projection a transfer pattern, as illuminated under the first illumination condition, onto a second object;

a light intensity detector for detecting an intensity distribution of light directed by said projection optical system to said light intensity detector, from a measurement pattern being illuminated under the second illumination condition; and

an information processing system for measuring wavefront aberration of said projection optical system on the basis of a result of detection by said light intensity detector;

wherein said illumination optical system includes a coherency-transforming optical system which is arranged to be inserted into ~~and/or~~ or demounted from said illumination

optical system as the first and second illumination conditions are to be switched from one to the other.

55. (Previously Presented) An apparatus according to Claim 54, wherein the second spatial coherency under the second illumination condition is higher than the first spatial coherency under the first illumination condition.

56. (Previously Presented) An apparatus according to Claim 54, further comprising an adjusting unit for adjusting a size of an effective light source of said illumination optical system as the first and second illumination conditions are to be switched from one to the other.

57. (Previously Presented) An apparatus according to Claim 56, wherein said adjusting unit includes a stop member having an aperture, and wherein the aperture of said stop member is adjusted as the first and second illumination conditions are to be switched from one to the other.

58. (Previously Presented) An apparatus according to Claim 57, wherein the aperture defined under the first illumination condition is larger than the aperture defined under the second illumination condition.

59. (Previously Presented) An apparatus according to Claim 54, wherein said light intensity detector is arranged to detect light intensity distributions at different detection positions,

being different from each other, with respect to an imaging position of a measurement pattern as illuminated under the second illumination condition, the imaging position being defined by said projection optical system, and wherein said information processing system is arranged to measure the wavefront aberration of said projection optical system on the basis of a result of detection of the light intensity distributions at the different detection positions made through said light intensity detector.

60. (Previously Presented) An apparatus according to Claim 59, wherein one of the different detection positions substantially corresponds to the imaging position of the measurement pattern.

61. (Previously Presented) An apparatus according to Claim 54, wherein the transfer pattern and the measurement pattern differ from each other.

62. (Previously Presented) A device manufacturing method, comprising:

a projection exposure step for transferring, by projection exposure, a pattern of a reticle onto a wafer by use of an exposure apparatus as recited in Claim 54; and

a development step for developing the wafer processed by said projection exposure step.